French River Watershed Summary

Long Branch Brook

Watershed Description and Maps

The French River watershed covers an area of approximately 64,663 acres in the northeast corner of Connecticut and south-central Massachusetts (Figure 1). The watershed encompasses 13 communities in Massachusetts and a portion of Thompson, Connecticut.

The French River watershed includes one segment impaired for recreation due to elevated bacteria levels. This segment (CT3300-02_01), was assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. Some segments in the watershed may be unassessed as of the writing of this document. However, this does not mean there are no problems on those segments, but is an indication that there are not current data to evaluate the segments as part of an assessment process. An excerpt of the Integrated Water Quality Report is included in Table 1.

The French River begins at Sargent Pond in Leicester, Massachusetts, and flows south through 10 Massachusetts communities including Auburn, Oxford, and Dudley before crossing the CT-MA state-line into Thompson, CT. The river continues south through several ponds including Langer's Pond, North Grosvenordale Pond, and Acme Pond north of the confluence with the Quinebaug River just south of West Thompson Lake. The river flows parallel to Rt. 12 for a majority of its length. The bacteria impaired segment, Long Branch Brook (CT3300-02_01), consists of 0.96 miles of stream northeast of North Grosvenordale Pond in Thompson, CT. Long Branch Brook is a tributary of the French River, and begins at the confluence of two first order streams west of I-395 near the CT-MA border. The stream flows west, crossing both Labby and Agher Road before flowing into the French River north of Wilsonville Road and the northern extent of Grosvenordale Pond.

Long Branch Brook is a Class A stream. Class A designated uses for Long Branch Brook (3300-02_01) include potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. As there are no designated beaches in this segment, the specific impairment for recreation is for non-designated swimming

Impaired Segment Facts

Impaired Segment: Long Branch Brook (CT3300-02_01)

Municipalities: Thompson

Impaired Segment Length (miles): 3300-02_01 (0.96)

Water Quality Classification: Class A (3300-02_01)

Designated Use Impairment: Recreation

Sub-regional Basin Name and Code: French River, 3300

Regional Basin: French River

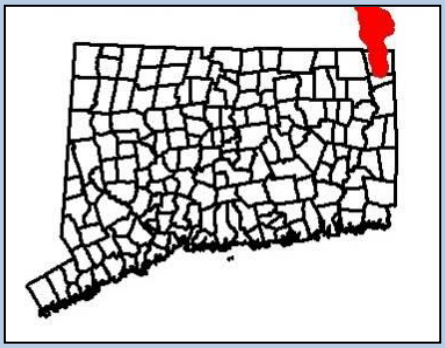
Major Basin: Thames

Watershed Area (acres): 64,663

MS4 Applicable? Yes

Applicable Season: Recreation Season (May 1 to September 30)

Figure 1: Watershed location in Connecticut



and other contact water-related activities.

Table 1: Impaired segments and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report

Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT3300-00_01	French River-01	From mouth at confluence with Quinebaug River (just DS of West Thompson Flood Control dam), US to North Grosvenordale Pond outlet dam (just US of Buckley Hill Road crossing), Thompson.	4.61	U	NOT*	FULL
CT3300-00_02	French River-02	From inlet to North Grosvenordale Pond (east of Route 12, just DS of Langers Pond), US to Massachusetts state line. Segment includes Langers Pond.	1.08	U	U	FULL

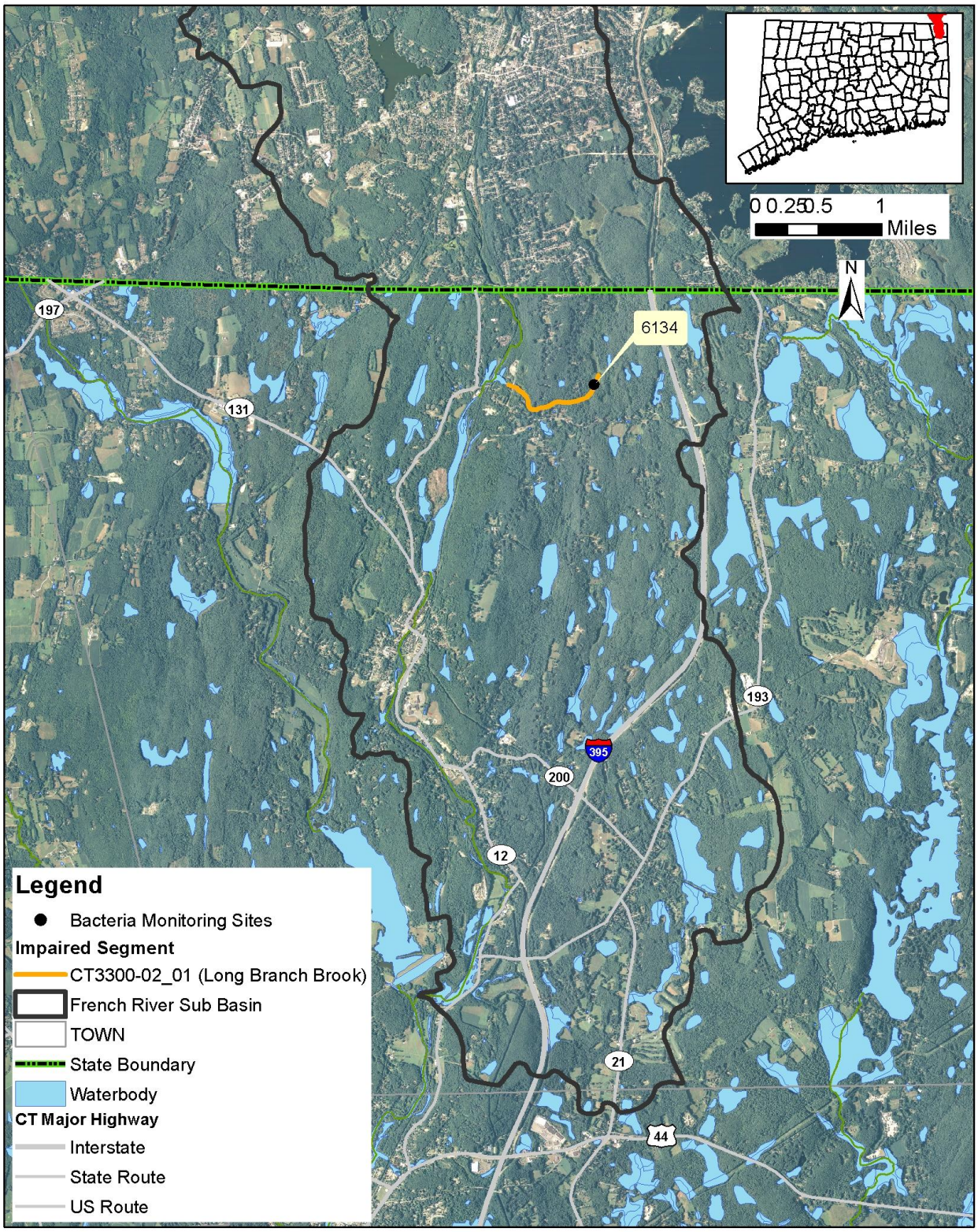
Shaded cells indicate impaired segment addressed in this TMDL
FULL = Designated Use Fully Supported
NOT = Designated Use Not Supported
U = Unassessed
***Data from 2010 shows the segment has attained water quality goals removed from 2012 Impaired Waters List**

********Based on 2010 305(b) designation. Impairments in segment 3300-02_01, Long Branch Brook, are based on 2010 data and this segment will be included on the 2012 list of impaired waterbodies. The segment is not included in this table but is highlighted in all mpas*

In addition to the impaired segment in CT, the State of Massachusetts has listed an additional three segments of the French River on the 305(b) list. All three segments are listed for pathogens. Two of these segments are located just across the CT-MA state-line, upstream, in Dudley and Webster http://iaspub.epa.gov/tmdl_waters10/attains_impaired_waters.control?p_state=MA

In 1999, the University of Massachusetts-Amherst prepared the draft French-Quinebaug Watershed Plan for the Massachusetts Department of Environmental Protection's French-Quinebaug Watershed Team (Ahern, et. al, 2009). However, while references were made to this document through literature searches, the document was not located electronically for inclusion into this document.

Figure 2: GIS map featuring general information of the French River watershed at the sub-regional level



French River Sub-Regional Basin Bacteria Impairments Map
Created January 2012 MAP Data: CT DEEP

Land Use

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from nutrients and bacteria from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the French River watershed consists of 56% forest, 24% urban, 12% water and wetland land uses, 8% agriculture, and < 1% other land uses. The upper reaches of the French River watershed near Long Branch Brook are characterized by a mix of forested land, patches of sparse agricultural land and urban development including both commercial, residential, and industrial (auto salvage facility, sand/gravel mining) land uses near major roadways (Figure 4). The impaired segment of Long Branch Brook flows through forested land surrounded by rural residential development. The northern tributary to Long Branch Brook originates in a large wetland, while the southern tributary drains agricultural land (Figure 5). Agricultural land along the impaired river segment is limited to a few agricultural crops.

Figure 3: Land uses within the French River watershed

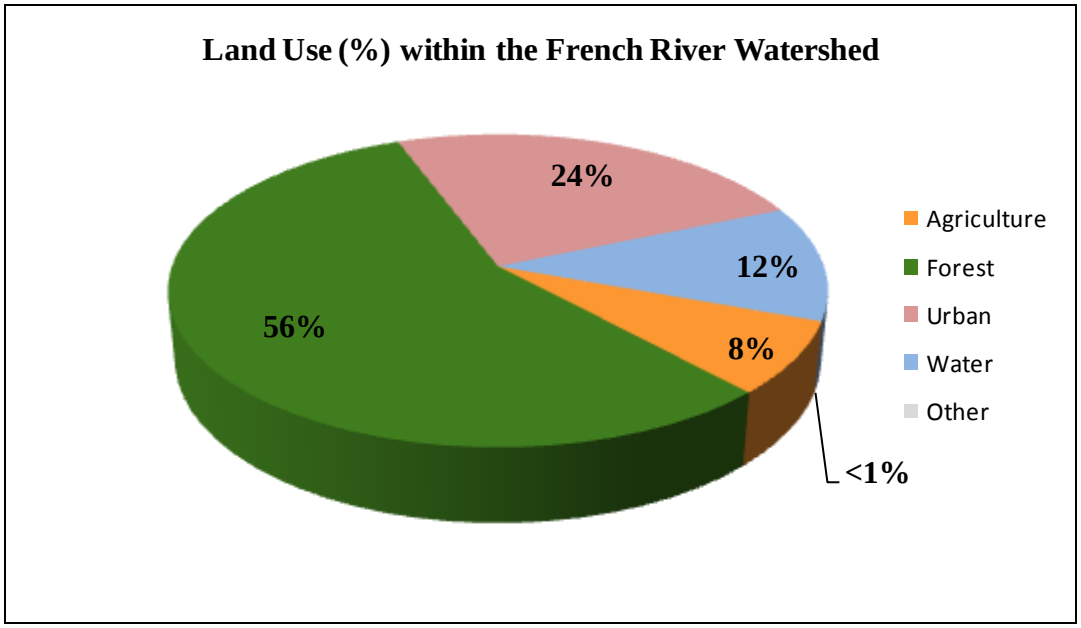
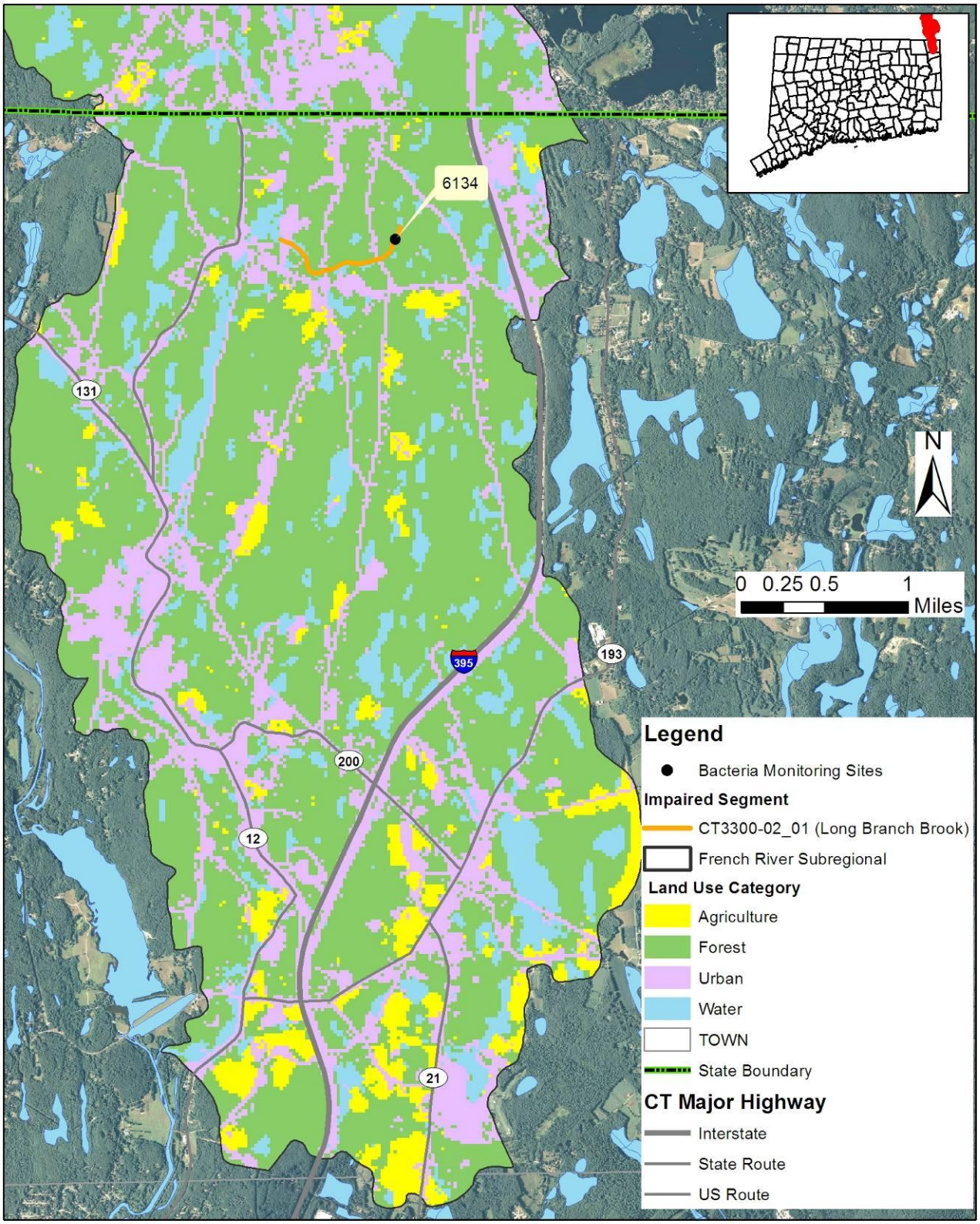


Figure 4: GIS map featuring land use for the French River watershed at the sub-regional level



WHY IS A TMDL NEEDED?

E. coli is the indicator bacteria used for comparison with the CT state criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture or volunteer monitoring efforts at stations located on the impaired segments.

Table 2: Sampling station location description for impaired segments in the French River watershed

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT3300-02_01	Long Branch Brook	6134	Labbey Road crossing	Thompson	42.013342	-71.869548

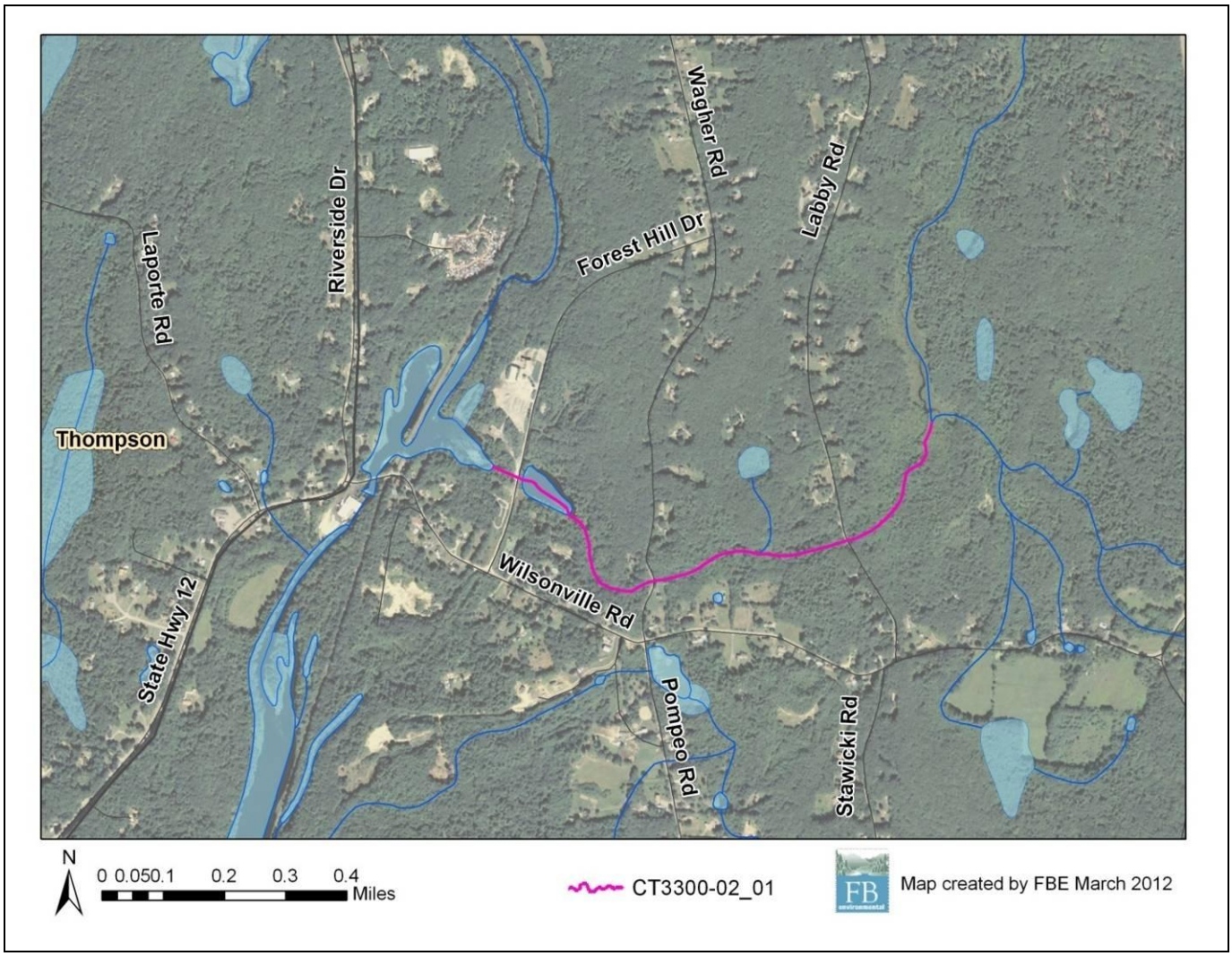
Long Branch Brook is a Class A stream. Class A designated uses are potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location on Long Branch Brook (Station 6134) in 2010 (Table 2).

For Long Branch Brook, the water quality criteria for *E. coli*, along with bacteria sampling results for Station 6134 in 2010 are presented in Table 8. The annual geometric mean was calculated for Station 6134 and exceeded the WQS for *E. coli* in 2010. Single sample values at this station also exceeded the WQS for *E. coli* twice in 2010.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for wet-weather and dry-weather sampling days, where appropriate (Tables 8). The wet geometric mean value at Station 6134 on Long Branch Brook exceeded the WQS for *E. coli.*

Due to the elevated bacteria measurements presented in Tables 8, this segment in the French River watershed did not meet CT's bacteria WQS, was identified as impaired, and placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all water bodies to comply with state WQS.

Figure 5: Aerial map of Long Branch Brook



POTENTIAL BACTERIA SOURCES

Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the French River watershed based on land use (Figures 3 and 4) and a collection of local information for the impaired waterbody is presented in Table 3 below and presented in Figure 7. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segment. Further monitoring and investigation will confirm listed sources and discover additional sources. For some segments, there are data from permitted sources, and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

Table 3: Potential bacteria sources in the French River watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/Pets	Other
Long Branch Brook CT3300-02_01	**x**			**x**	**x**	**x**	**x**	

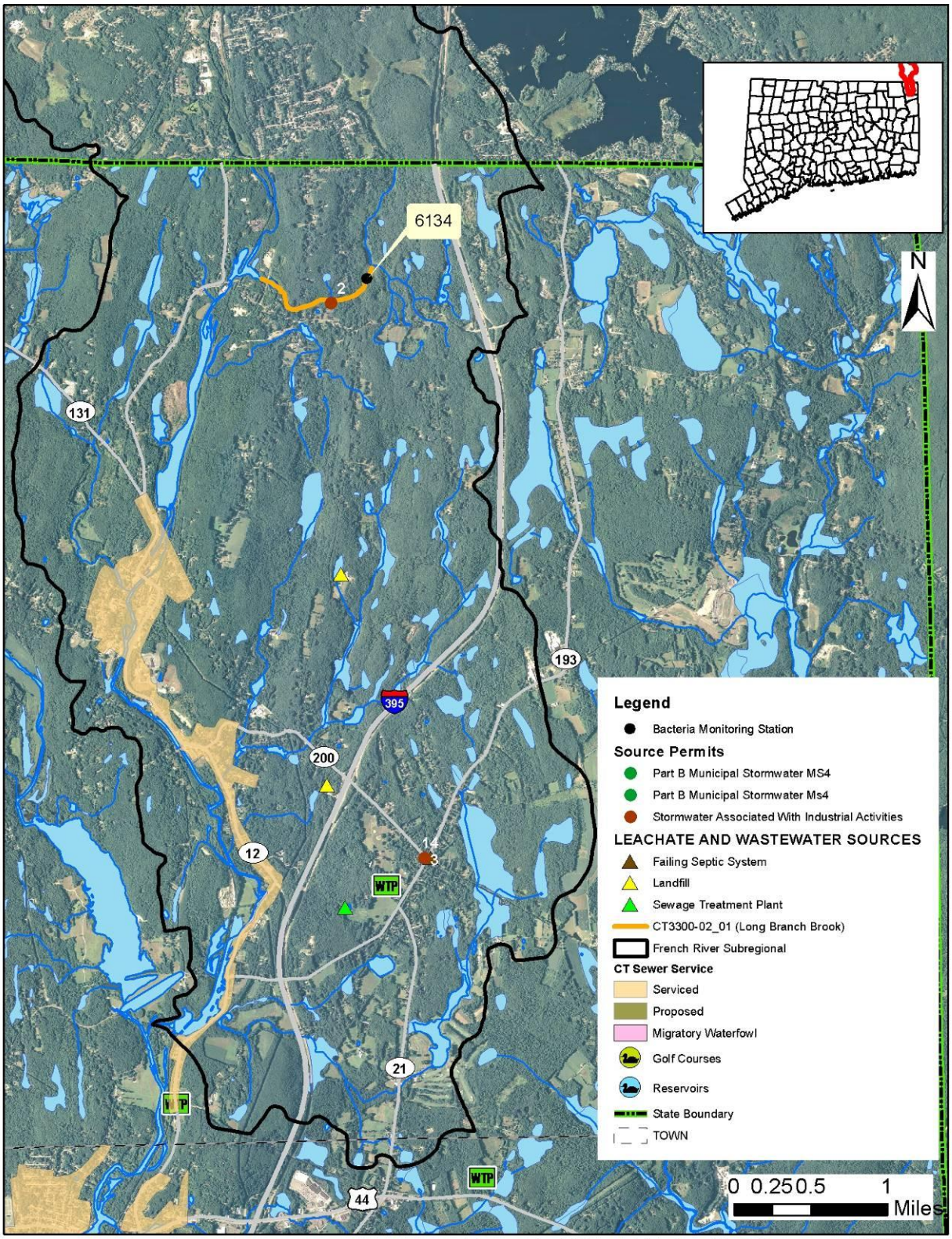
Point Sources

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. Additional investigation and monitoring may reveal the presence of additional discharges in the watershed. Permits specific to the French River watershed are listed in Table 5. Available effluent data from each of these permitted categories found within the watershed are compared to the CT State WQS for the appropriate receiving waterbody use and type.

Table 4: General categories list of other permitted discharges

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	0
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	0
GSI	Stormwater Associated with Industrial Activity	1
GSM	Part B Municipal Stormwater MS4	1
GSN	Stormwater Registration – Construction	0
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	0

Figure 6: Potential sources in the French River watershed at the sub-regional level



French River Potential Sources Map

Created January 2012 MAP Data: CT DEEP

The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map it is because no examples of that specific source were discovered to be present during the analysis of the basin. The following is the list of potential sources that were evaluated during analysis of the impaired basin: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

Permitted Sources

As shown in Table 5, there is only one permit discharging into Long Branch Brook, the other permit is the town-wide MS4 permit. . Bacteria data from 2001-2003 is available for the industrial permitted facility (Table 6). This data cannot be compared to a water quality standard as Connecticut does not have a water quality standard to evaluate recreation use for fecal coliform bacteria. However, results from Tilcon Connecticut Inc. were less than 380 in all instances.

Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point (Figure 8). Sometimes this location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit.

Table 5: Permitted facilities within the French River watershed

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
North Grosvenordale	Tilcon Connecticut Inc.	GSI000582	Stormwater Associated With Industrial Activities	Tilcon Connecticut Inc	2
Thompson	Town Of Thompson	GSM000112	Part B Municipal Stormwater MS4	Thompson, Town Of	3

Table 6: Industrial permits in the French River watershed and available fecal coliform data (colonies/100mL). The results cannot be compared to the water quality standard as there is no recreation standard for fecal coliform.

Town	Location	Permit Number	Receiving Watershed	Sample Location	Sample Date	Result
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 001	09/25/01	86
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 001	08/29/02	0
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 001	07/11/03	0
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 002	09/25/01	300
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 002	08/29/02	0
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 002	07/11/03	12
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 003	09/25/01	380
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 003	08/29/02	0
Thompson	Tilcon Connecticut	GSI582	French River	Wilsonville 003	07/11/03	6

Municipal Stormwater Permitted Sources

US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s)

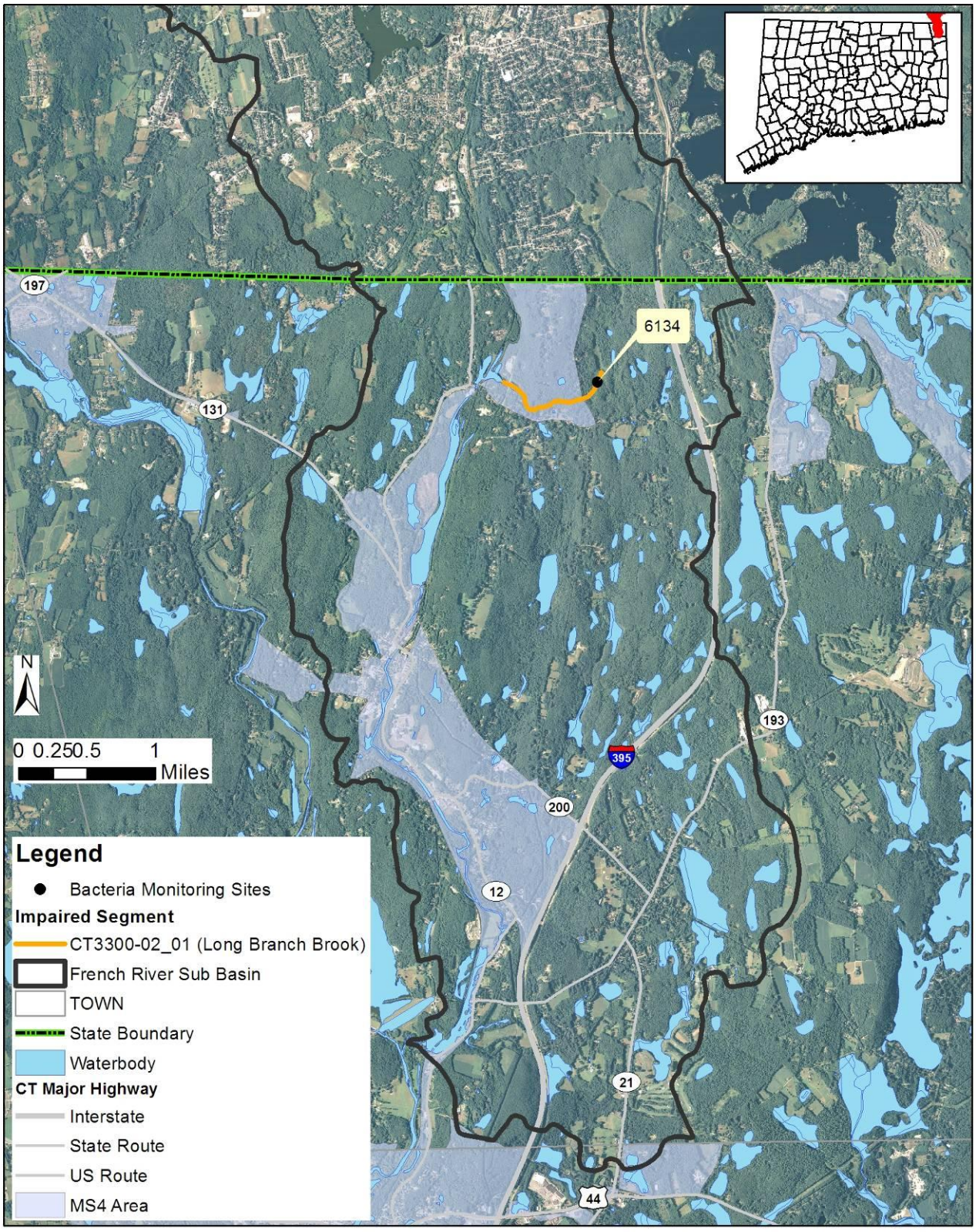
together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.

As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Woodstock. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

Figure 7: MS4 areas of the French River watershed



French River Sub-Regional Basin Designated MS4 Map
Created January 2012 MAP Data: CT DEEP

The impaired segment in the French River watershed is located within the Town of Thompson, CT. The town is largely urbanized, as defined by the U.S. Census Bureau, and is required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the Connecticut Department of Energy and Environmental Protection (DEEP). The designated MS4 area is located along the length of the impaired segment (Figure 8). This general permit is only applicable to municipalities that are identified in Appendix A of the MS4 permit that contain designated urban areas and discharge stormwater via a separate storm sewer system to surface waters of the State. The permit requires municipalities to develop a Stormwater Management Plan (SMP) to reduce the discharge of pollutants and protect water quality. The MS4 permit is discussed further in the "TMDL Implementation Guidance" section of the core TMDL document. Additional information regarding stormwater management and the MS4 permit can be obtained on CTDEEP's website (www.ct.gov/dep/stormwater).

Non-point Sources

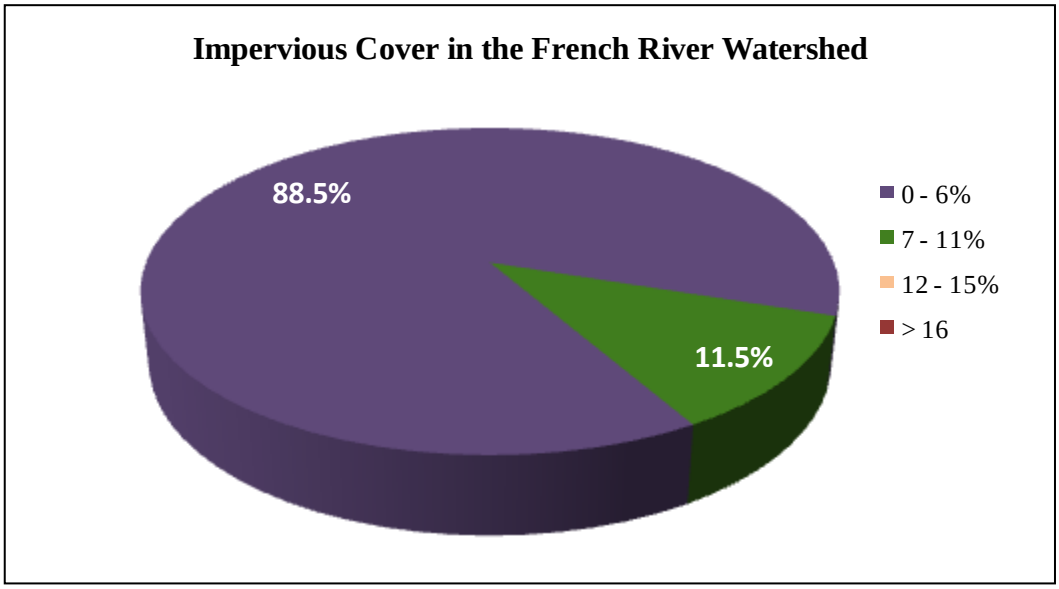
Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the French River watershed are described below.

Stormwater Runoff from Developed Areas

Twenty-four percent of the French River watershed is developed. Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate into the soil. Studies have shown a link between increasing impervious cover and degrading water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover in a watershed (Mallin *et al*., 2000).

As shown in Figure 9, approximately 11.5% of the French River watershed contains between 7-11% impervious cover, while the remaining 88.5% contains between 0-6% impervious cover. The areas with the highest percentage of imperviousness are located with the Rt. 12 corridor adjacent to French River below North Grosvenordale Pond, near Marianapolis Sports Field, and in the commercialized shopping area near the I-395/Rt. 44 crossing including Wal-Mart and Super Shop & Shop (Figure 10). The impaired segment of Long Branch Brook is located within an area characterized by only 0-6% impervious cover due to the rural residential, and agricultural development in this part of the watershed. Water quality data taken at Station 6134 at the Labbey Road crossing yielded a high wet-weather geometric means that exceeded the water quality standard for *E. coli* in 2010, suggesting that stormwater runoff may be a concern for Long Branch Brook. A stormwater outfall from industrial activities is located downstream of Station 6134 on Long Branch Brook (Figure 6). Stormwater pollution sources include fertilizer runoff, leaky septic systems, horse farms, golf courses, and impervious surfaces.

Figure 8: Range of impervious cover (%) in the French River watershed



Insufficient Septic Systems and Illicit Discharges

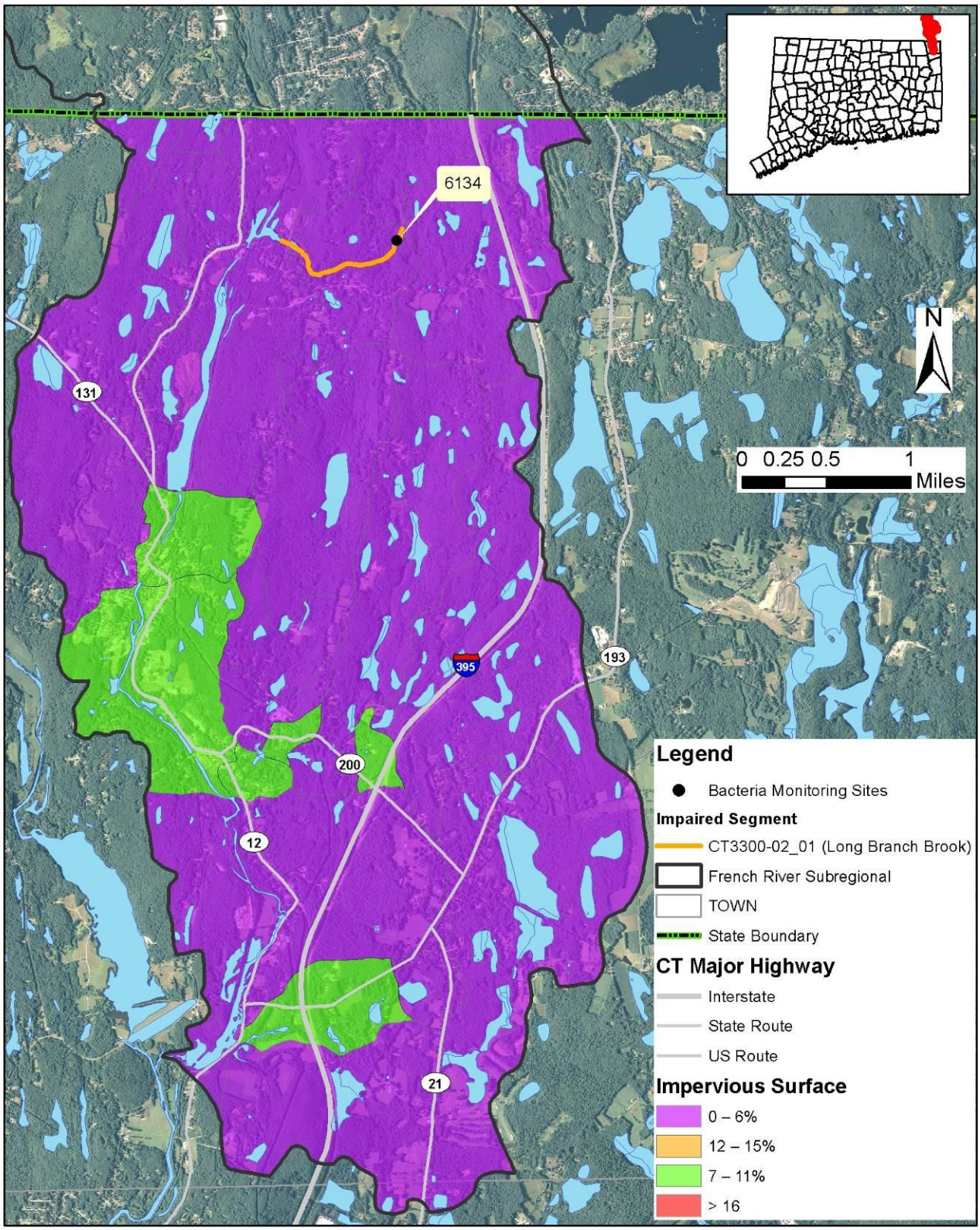
As shown in Figure 6, a majority of the French River watershed relies on onsite wastewater treatment systems, such as septic systems. Insufficient or failing septic systems can be significant sources of bacteria by allowing raw waste to reach surface waters.

In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. The Town of Thompson is part of the Northeast District Department of Health with a full-time health director (http://www.nddh.org).

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA, 2011a). This runoff can include pollutants from farm practices such as storing manure, allowing livestock to wade in nearby waterbodies, applying fertilizer, and reducing the width of vegetated buffer along the shoreline. Agricultural land use makes up 8% of the French River watershed. While there are no documented large animal operations in the watershed, it's likely that there are small hobby farms in the watershed. Agricultural fields are scattered throughout the watershed (Figure 4). Large agricultural fields are located adjacent to the French River and in close proximity to several tributary streams to the French river in the southeast corner of the watershed. A cluster of agricultural fields near the headwater tributaries of Long Branch Brook are another potential source of bacteria and nutrients. A lack of vegetated buffers between hayfields, row crops, and livestock areas and waterbodies can result in a potential source of bacteria to Long Branch Brook.

Figure 9: Impervious cover (%) for the French River sub-regional watershed



Impervious Surfaces In The French River Sub Regional Basin

Created: Janauary 2012 MAP Data: CT DEEP

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the French River watershed represent another potential source of bacteria. Wildlife, including waterfowl, may be a significant bacteria source to surface waters. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. These physical land alterations can exacerbate the impact of these natural sources on water quality (USEPA, 2001). As the majority of the watershed is residential development adjacent to the impaired segments, pet waste may be a more direct potential source of bacteria.

Geese and other waterfowl are known to congregate in open areas including recreational fields, agricultural crop fields, and golf courses. In addition to creating a nuisance, large numbers of geese can also create unsanitary conditions on the grassed areas and cause water quality problems due to bacterial contamination associated with their droppings. Large populations of geese can also lead to habitat destruction as a result of overgrazing on wetland and riparian plants. In additional, waterfowl and other wildlife are attracted to areas of open water including the many ponds throughout the watershed.

Additional Sources

As shown in Figure 7, there are several additional sources of pollution in the watershed including two landfills located east of French River mainstem, and effluent from the Waste Water Treatment Plant. There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in the French River watershed. Further monitoring and investigation will confirm the listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

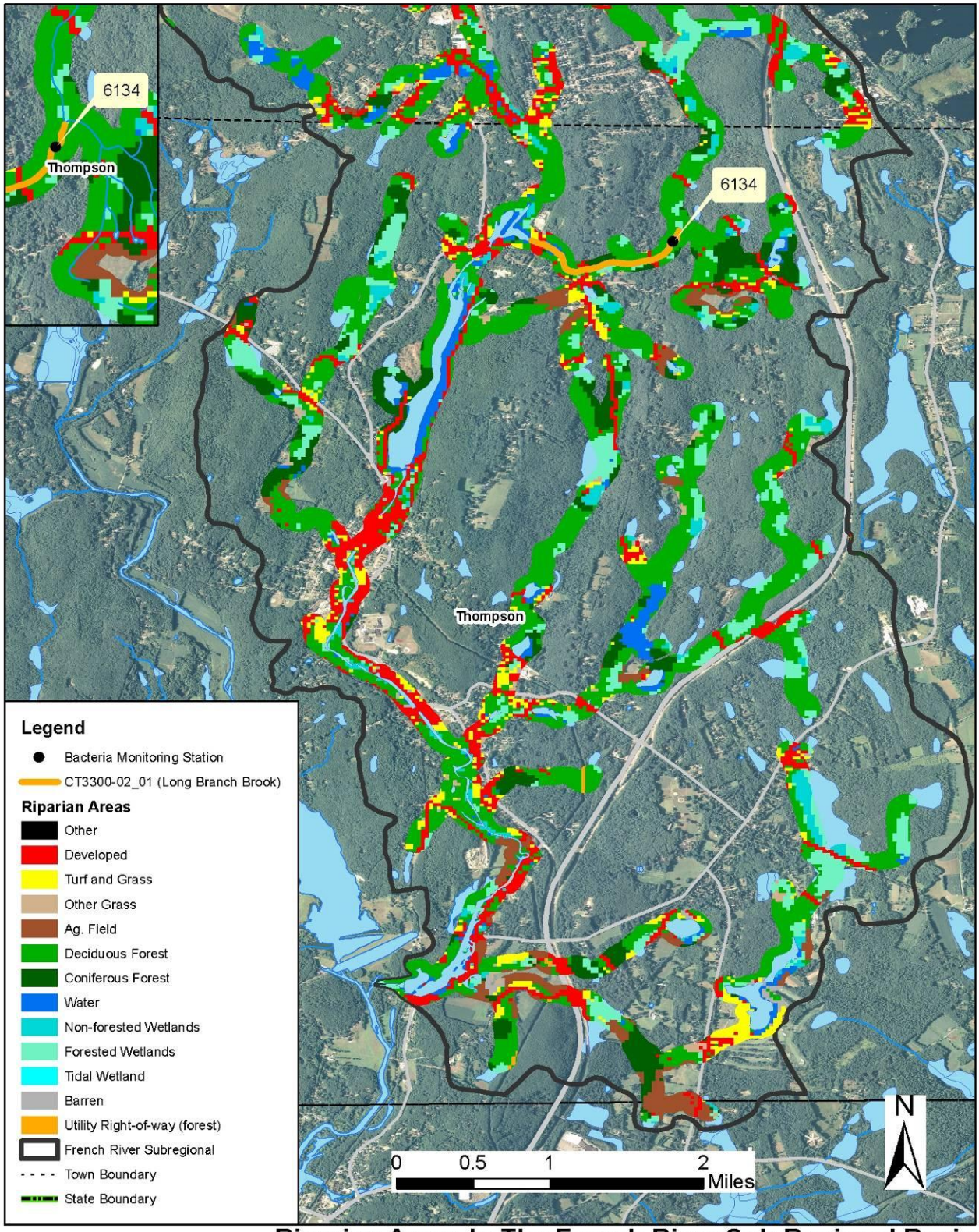
Land Use/Landscape

Riparian Buffer Zones

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and the adjoining uplands is gradual and not always well-defined. However, riparian zones differ from uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their unique soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (http://clear.uconn.edu/), which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. The land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff sources.

Figure 10: Riparian buffer zone information for the French River watershed



Riparian Areas In The French River Sub Regional Basin

Map Data: DEEP/ UCONN CLEAR Map Created January 2012

The riparian buffer along Long Branch Brook is characterized by deciduous forest with development limited largely to roads. As previously noted, if not properly treated, runoff from developed areas may contain pollutants such as bacteria and nutrients.

CURRENT MANAGEMENT ACTIVITIES

The Town of Thompson is proactive in river protection activities. The Town of Thompson Together coalition, along with the Massachusetts-based French River Connection and other watershed stakeholders, continue action strategy development for water quality and watershed issues along the French River watershed, and across State boundaries (CTDEP, 2009). The Coalition hosts the French and Quinebaug River annual roadside clean-ups to celebrate Earth Day. In addition, the committee has held fundraisers for riparian buffer plantings along the French River in Riverside Park (CT DEP, 2007). In addition, town staff developed a pre-proposal for a stormwater retrofit project at the Town Hall parking lot that contributes runoff to the downstream Riverside Park and French River. This project has potential for a municipal demonstration project that would increase awareness and pragmatic steps taken in the community towards restoring favorable water quality conditions (CT DEP, 2009). Since Long Branch Brook is a tributary to French River, it is a recommendation of this document, to the Coalition to investigate extending efforts to the impaired tributary.

The CT DEP provided Section 319 NPS funds to the Quinebaug-Shetucket Heritage Corridor Water Subcommittee Coordinator to fund necessary water quality equipment for a citizen monitoring project in Thompson, CT, while the Coordinator also obtained funding support for the Commonwealth of Massachusetts to obtain water quality monitoring equipment for citizen monitoring work in the Dudley, Oxford and Webster, MA communities within the French River watershed. Data collected within Thompson was provided to CT DEP Water Monitoring program for integration in the Integrated Water Quality Assessment report.

In 2009 NRCS successfully completed the French River Riparian Buffer Demonstration Project in Riverside Park along the French River. Final planting design led to town installation of a rain garden collecting runoff from a small park gazebo, 1000 feet of riparian area plantings of native perennials, shrubs and trees, interpretive signage and recreational amenities including pet waste collecting stations, picnic benches and a river fishing access site. Trained town volunteers and town maintenance staff continued raising funds to extend riparian plantings twice in 2009 and to extend the adjacent park walking trail to connect to the towns nearby Community Center (CT DEP, 2009). Part of the project involved a stream walk investigation of a portion of the French River for further potential restoration sites (TRBP, 2006) as well as a French River Stream Assessment Report (TRBP, 2008). The project included two riparian buffer workshops for area towns and interested residents (CT DEP, 2012). Long Branch Brook should be a target of future stream walks and investigation for buffer enhancement activities.

As indicated previously, the Town of Thompson is regulated under the MS4 program. The MS4 General Permit is required for any municipality with urbanized areas that initiates, creates, originates or maintains any discharge of stormwater from a storm sewer system to waters of the state. The MS4 permit requires towns to design a Stormwater Management Plan (SMP) to reduce the discharge of pollutants in stormwater to improve water quality. The plan must address the following 6 minimum measures:

1. Public Education and Outreach.
2. Public Involvement/Participation.

3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Each town is also required to submit an annual update outlining the steps they are taking to meet the six minimum measures. Unfortunately the Town of Thompson has submitted no monitoring information or Annual Reports to CT DEEP and has received a Notice of Violation for their lack of compliance with the program.

RECOMMENDED NEXT STEPS

Future mitigative activities are necessary to ensure the long-term protection of the French River Watershed and especially Long Branch Brook, and have been prioritized below.

1). Identify areas along the developed portions of the French River Watershed to implement Low Impact Development (LID) and Best Management Practices (BMPs) to control stormwater runoff.

As noted previously, 24% of the French River watershed is considered urban, and the Town of Thompson is regulated by the MS4 program. There are large areas of commercial and high-density residential development in the watershed that contain impervious cover ranging from 7-11%. Areas with lower levels of impervious cover are more common north of Grosvenordale Pond near the impaired segment of Long Branch Brook. The land surrounding the impaired segment of Long Branch Brook is largely rural, so stormwater runoff from agricultural land may be a source of bacterial contamination. As such, stormwater runoff is most likely contributing bacteria to the waterbodies.

Low Impact Development (LID) is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. The Town of Thompson should consider adopting LID development principles into local land use plan regulations if they have not already done so.

To treat stormwater runoff, the municipalities should identify areas along the impaired segment to install BMPs designed to encourage stormwater to infiltrate into the ground before entering the waterbodies. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. More detailed information and BMP recommendations can be found in the core TMDL document.

2) Restore riparian vegetation in areas where it has been removed; address stream bank erosion.

Management of riparian vegetation protects streams from the impacts of developed land by trapping sediments, bacteria, nutrients, and other pollutants before they enter the stream. Therefore, restoring riparian vegetation in areas where it has been removed (developed areas) will help improve water quality in the stream. Identifying and prioritizing sites for establishment of buffers, obtaining interest and permission from landowners, and acquiring funding to plant the buffers are some of the key steps to success.

3). Evaluate municipal education and outreach programs regarding animal waste.

As a large percentage of the French River watershed is developed by residential neighborhoods or open spaces, any education and outreach program should highlight the importance of picking up after horses, dogs, and other pets and not feeding waterfowl and wildlife. The municipalities and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of the watershed that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in the French River watershed and can harm human health and the environment. Animal wastes should be disposed of away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-use areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

4). Develop a system to monitor septic systems.

Most residents in the French River watershed rely on septic systems. If not already in place, the town of Thompson should establish programs to ensure that existing septic systems are properly operated and maintained, and create an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard systems within a reasonable timeframe can be adopted. The municipalities should also develop a program to assist citizens with the replacement and repair of older and failing systems.

5). Continue monitoring of permitted sources.

Although there is currently limited data on permitted sources within the French River watershed, permitted discharges may be a potential source of bacteria that the town should investigate further. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility is an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection. Table 7 details the appropriate waste load allocations established by this TMDL for use as water quality targets for permittees as permits are renewed and updated, within the French River watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

Table 7. Bacteria (e.coli) TMDLs, WLAs and LAs for Recreational uses

		Instantaneous *E. coli* (#/100mL)						Geometric Mean *E. coli* (#/100mL)	
Class	**Bacteria Source**	**WLA[6]**			**LA[6]**			**WLA[6]**	**LA[6]**
	Recreational Use	**1**	**2**	**3**	**1**	**2**	**3**	**All**	**All**
A	Non-Stormwater NPDES	0	0	0				0	
	CSOs	0	0	0				0	
	SSOs	0	0	0				0	
	Illicit sewer connection	0	0	0				0	
	Leaking sewer lines	0	0	0				0	
	Stormwater (MS4s)	235[7]	410[7]	576[7]				126[7]	
	Stormwater (non-MS4)				235[7]	410[7]	576[7]		126[7]
	Wildlife direct discharge				235[7]	410[7]	576[7]		126[7]
	Human or domestic animal direct discharge[5]				235	410	576		126
	Stormwater (non-MS4)	0	0	0				0	
	Wildlife direct discharge	0	0	0				0	
	Human or domestic animal direct discharge[5]	0	0	0				0	

(1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.

(2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.

(3) **All Other Recreational Uses.**

(4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)

(5) Human direct discharge = swimmers

(6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations

(7) These values can be "as naturally occurs" if the only pollutant source is wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.

6). Ensure there are sufficient buffers on agricultural lands along Long Branch Brook.

Agricultural land use represents 8% of the French River watershed. Agricultural producers should continue to work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service to develop conservation plans for their farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing

exists to restrict access to livestock and horses from streams and wetlands, and that animal waste handling, disposal, and other appropriate BMPs are in place.

7). Come into compliance with the MS4 program.

The Town of Thompson should complete their obligations under the MS4 program and begin monitoring stormwater outfalls and completing the other required components of the program.

Bacteria Data and Percent Reductions to Meet the TMDL

Table 8: Long Branch Brook Bacteria Data

Waterbody ID: CT3300-02 _01

Characteristics: Freshwater, Class A, Potential Drinking Water Supplies, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, Navigation, and Industrial and Agricultural Water Supply

Impairment: Recreation (*E. coli bacteria)*

Water Quality Criteria for E. coli:

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

Percent Reduction to meet TMDL:

Geometric Mean: **N/A**

Single Sample: **59%**

Data: 2010 from (Station 6134) from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Long Branch Brook with annual geometric means calculated by station (notes located at the end of the table)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
6134	Labbey Road crossing	6/14/2010	130	wet	**143* (0%)**
6134	Labbey Road crossing	6/23/2010	120	wet	
6134	Labbey Road crossing	6/28/2010	112†	dry	
6134	Labbey Road crossing	7/8/2010	74	dry	
6134	Labbey Road crossing	7/13/2010	104†	dry	
6134	Labbey Road crossing	7/22/2010	215†	dry	
6134	Labbey Road crossing	7/29/2010	510	wet	
6134	Labbey Road crossing	8/5/2010	**1000* (59%)**	wet	
6134	Labbey Road crossing	8/11/2010	75	dry	
6134	Labbey Road crossing	8/19/2010	92†	dry	
6134	Labbey Road crossing	9/15/2010	52	dry	

Shaded cells indicate an exceedance of water quality criteria

†Average of two duplicate samples

***Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet and dry weather *E. coli* (colonies/100 mL) geometric mean values for Station 6134 on Long Branch Brook

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
6134	Labbey Road crossing	2010	4	7	143	299	94
Shaded cells indicate an exceedance of water quality criteria							
Weather condition determined from rain gage at West Thompson Lake, Grosvenor Dale in Thompson, CT							

REFERENCES

Costa, Joe (2011). Calculating Geometric Means. Buzzards Bay National Estuary Program. **Online**: http://www.buzzardsbay.org/geomean.htm

CTDEEP (2011). State of Connecticut Water Quality Standards. **Online:** http://www.ct.gov/dep/lib/dep/water/water_quality_standards/wqs_final_adopted_2_25_11.pdf

CT DEEP (2012). DEEP 319 and other Nonpoint Source Funded Projects 2005-2009. 05-16 French River, Thompson Riparian Buffer, (NRCS). Connecticut Department of Energy and Environmental Protection. **Online:** http://www.ct.gov/dep/cwp/view.asp?a=2719&q=431984&depNav_GID=1654

CT DEP (2007). Thompson Together Environment Committee Recognized for Environmental Contribution in Connecticut: DEP presents group with Green Circle Award. Connecticut Department of Energy and Environmental Protection. Online: http://www.ct.gov/dep/cwp/view.asp?A=2794&Q=331726

CT DEP (2009). Connecticut Department of Environmental Protection. Nonpoint Source Management Program 2009 Annual Report. August, 2010. **Online:** http://www.ct.gov/dep/lib/dep/water/nps/annualreports/2009annualreport.pdf

CWP (2003). Impacts of Impervious Cover on Aquatic Systems. Center for Watershed Protection. **Online**: http://clear.uconn.edu/projects/tmdl/library/papers/Schueler_2003.pdf

Mallin, M.A., K.E. Williams, E.C. Escham, R.P. Lowe (2000). Effect of Human Development on Bacteriological Water Quality in Coastal Wetlands. Ecological Applications 10: 1047-1056.

USEPA (2001). Managing Pet and Wildlife Waste to Prevent Contamination of Drinking Water. **Online**: http://www.epa.gov/safewater/sourcewater/pubs/fs_swpp_petwaste.pdf.

USEPA (2011a). Managing Nonpoint Source Pollution from Agriculture. **Online:** http://water.epa.gov/polwaste/nps/outreach/point6.cfm

USEPA (2011b). Riparian Zone and Stream Restoration. **Online:** http://epa.gov/ada/eco/riparian.html